Introduction

Perspectives on Science and Culture

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This edited volume in the Comparative Cultural Studies Series explores the intersection between scientific understanding and cultural representation from an interdisciplinary perspective. The contributions in this volume analyze popular representations of science and scientific discourse from the perspectives of rhetorical criticism, comparative cultural studies, narratology, educational studies, discourse analysis, the cognitive sciences, and naturalized and evolutionary epistemology. As such, the volume fits within the theoretical and methodological framework of comparative cultural studies as a contextual approach to the study of culture from an interdisciplinary perspective. The main objective of this volume is to explore how particular cognitive predispositions and cultural representations both shape and distort the public debate about scientific controversies, the teaching and learning of science, and the development of science itself. Theoretically, this volume will integrate, on the one hand, C. P. Snow's concept of the two cultures (science versus the humanities) and Jerome Bruner's confrontation between narrative and logico-scientific modes of thinking and, on the other hand, cognitive and epistemological approaches to human cognition and culture, including science.

From this unique conciliatory framework, the volume explores how narratives and other cultural representations transform complex scientific issues into digestible bits of information based on particular selections and deflections. Some of the contributions analyze how scientific representations and metaphors of science take shape in pictures, cartoons, and television broadcasts, but also in novels and popular magazines. Others specifically focus on the implications of these representations and (mis)understandings for science education, both in

formal and informal educational settings. Thematically, the contributions focus on a wide range of current debates about evolutionary theory, global warming, genetic modification, and so on. As such, it indirectly engages with discussions pertaining to the politics of science. The aim of this volume is to engage in the ongoing debate about the public understanding of science and is original in its interdisciplinary scope, ranging from philosophy, cognitive psychology, anthropology, and biology to literature, cultural studies, and rhetoric.

Public Understanding of Science

There has been increasing attention on the valorization of scientific research, in combination with a growing public debate about the uses and applications of scientific findings for social and economic purposes (Benneworth and Jongbloed). Media coverage of scientific findings plays an important role in shaping the public understanding of science and as such creates a context for socio-ethical debates about the application and development of scientific research (van Dijck). However, the communication of science is always, inevitably partial and this partiality raises issues of authority, creates potential misunderstandings, and complicates the public debate about science (Tietge). One of the main aims of science communication and programs aimed at increasing scientific literacy is to create a better public understanding of science and to emphasize its wider relevance to society (Gross, "Roles").

Science communication often consists of a one-way flow from scientists to the general public by accommodating scientific findings to a nonexpert audience. Such a unilateral approach is indeed important for transferring relevant scientific knowledge to society but runs the risk of disregarding the contexts that give science its public significance and the ambiguities that arise from particular framings in the public debate (Gross, "Roles" and *Rhetoric*). Public concerns and opinions from stakeholders are often seen as (unwarranted) anxieties or vested interests rather than "assets" that have a role to play in the debate about scientific developments and applications (Bauer; Bauer, Shukla and Allum). There is an entangled and reciprocal relationship between science and society and therefore there is a need for a better understanding of the accommodation of scientific findings from experts to lay audiences, for an understanding of the different positions in the scientific and the public debate, and for an integration of scientific developments and the needs of society (Fahnestock; Gross, "Roles" and *Rhetoric*; Tietge, *Rational*).

For example, there is an ongoing body of research on the public understanding of genetics. Although there have been vast scientific advances in DNA

technology, the socio-ethical and the legal and political debates still remain very contested and ambivalent. In her seminal work, *Imagenation,* José van Dijck has shown that the public imagination of genetics has undergone an important transformation during the decades that this branch of scientific research took shape, as the synopsis of her book notes: "From news stories of DNA strings escaping from our laboratories to the ongoing debates over bioethics, from James Watson and *The Double Helix* to the Human Genome Project, Van Dijck portrays the 'imaginary' tools of genetics as players in a theater of representation—a multilayered contest in which special interest groups and professional organizations mobilize images in a heated debate over the meaning of genetics" (van Dijck). Popular representations of genetics do not necessarily reflect the advancement of genetic technology but these cultural accounts offer the repertoires and images with which different stakeholders debate the social, legal, political, and moral issues related to genetics research.

Rhetoric of Science

In this volume, rhetoric is introduced as one of the approaches to studying the public understanding of science. Rhetoric is the study and practice of persuasion. Scientists are inevitably engaged in the process of persuasion both within the academic community and outside, in public forums which need to be considered as different rhetorical situations (Simons; Harris; Journet). The focus of "new rhetoric" has expanded to many discursive domains, including science. There is a growing body of work on the rhetoric of science (Gross, "Roles" and *Rhetoric*; Gaonkar, "Idea"; Fahnestock; Harris; Simons), which focuses on the rhetoric of the scientific article (Gross et al.), the role of metaphors in the communication of science (Journet), the popularization of science (Tietge), and the critical assessment of emerging technologies (Zappen). As Alan Gross has argued, "The rhetorical view of science does not deny 'the brute facts of nature'; it merely affirms that these 'facts,' whatever they are, are not science itself . . . Whatever they are, the 'brute facts' themselves mean nothing; only statements have meaning, and of the truth of statements we must be persuaded. These processes, by which problems are chosen and results interpreted, are essentially rhetorical: only through persuasion are importance and meaning established" (Gross, *Rhetoric* 4).

The application of rhetorical studies to science has also been used to analyze the discourse of popular culture and how it relates to complex social phenomena such as the proliferation of pseudoscience (Gunn) or antipsychiatry (Rutten

et al.). The rhetoric of science studies how scientists—as part of a discursive community—frame and communicate their knowledge, what they argue about and how, how scientists present their findings, and what genres, formats, and media they use to communicate those findings (Ornatowski). Despite the growing body of scholarship on the rhetoric of science, there is a need for further development of rhetoric as a framework for the public understanding of science, specifically given the increasingly mediatized public debate in an expert-dominated society (Fahnestock; van Dijck). A rhetorical approach to scientific discourse studies how particular framings of scientific findings and developments influence the socio-ethical debate, how this relates to science policy, and how an awareness of the rhetorical dimensions of science is important for scientific as well as nonscientific audiences and what the educational dimensions are of such a rhetorical awareness.

Two Cultures

In this volume, we also discuss the ongoing confrontation between science and the humanities by focusing on C. P. Snow's concept of the two cultures (and the so-called science wars) and Jerome Bruner's confrontation between narrative and logico-scientific modes of thinking. The concept of the "two cultures" refers to C. P. Snow's famous 1959 essay in which he problematized the gap between literary intellectuals and scientists. Until today, the concept has survived as a trope to frame the debate between the humanities and science. The notion of the two cultures was also central in the work of the educational psychologist Jerome Bruner, who confronted two modes of thought, two modes of cognitive functioning, each rendering different and distinctive ways of constructing reality and ordering experience: the *logico-scientific mode* and the *narrative mode*. For Bruner, these two modes are complementary though irreducible to each other and both have different operating principles, different criteria of well-formedness and different procedures for verification. The main difference is that logico-scientific arguments need to convince by applying procedures for establishing formal and empirical proof, and that narratives can convince of their lifelikeness by verisimilitude (Rutten; Rutten and Soetaert).

The logico-scientific mode of thinking focuses on general and empirically tested truths, and the knowledge that it produces should not be contradictory. The narrative mode, on the other hand, focuses on the intentionality of human actions (what and why?) and the context in which these actions took place (where and when?). From the narrative perspective, *truth* is approached

as situated or contextual. Indeed, as Bruner states, "the imaginative application of the paradigmatic mode leads to good theory, tight analysis, logical proof and empirical discovery guided by reasoned hypothesis. . . . The imaginative application of the narrative mode leads instead to good stories, gripping drama, [and] believable (though not necessarily 'true') historical accounts" (13; also qtd. in Rutten and Stoetaert). It is not the aim in this volume to evaluate the difference between these two modes of thought. Indeed, Bruner himself has already pointed out the problematic aspect of this strict distinction between two modes of cognitive functioning (for an extended discussion of these two modes see Rutten; Rutten and Soetaert). However, based on Bruner's theory of narrative as a specific mode of knowing, the aim is, among others, to study what can be learned from narratives and to explore how narratives can be used as tools to thematize and problematize the distinction between the two cultures.

Cognitive Science

Besides rhetorical and narrative approaches to the study of science and culture, this volume will also introduce perspectives from cognitive science. Cognitive science comprises several disciplines such as artificial intelligence, psychology, and philosophy that treat the mind as an information-processing organ. Decades of research have made it clear that the mind can only perform that function if it holds particular expectations about the world. If it did not, the mind would be absolutely clueless as to which information to attend to and how to handle it. An important category of such expectations is "intuitive ontologies," which are spontaneous assumptions and inferences about the causal structure of particular domains of reality (Boyer). For example, folk physics deals with inanimate objects, folk biology is concerned with the living world, and folk psychology guides our inferences about agents. These intuitions work fast, automatically, and under the radar of conscious awareness, but they do exert an important influence on the beliefs we hold reflectively, both at the individual and at the cultural level.

The epidemiology of representations, developed by cognitive anthropologist Dan Sperber, explains how the susceptibilities of the human mind shape and constrain the formation and distribution of beliefs. *Ceteris paribus,* the representations that tap into our intuitive expectations stand a better chance of grabbing attention, being remembered, and transmitted. Played out over multiple transmissions, these representations will become the most popular within a particular population. In other words, they will become cultural. Intuitive ontologies, too, fix a lot of cultural content as they affect our beliefs about the world around us.

These beliefs might be intuitively appealing but they are usually not scientifically accurate. Creationist stories, for instance, tap into our folk biology and psychology, but hardly provide an adequate explanation for the origin and the diversity of species (Blancke and De Smedt).

For that reason, a proper understanding of human cognition in general and intuitive ontologies in particular is essential for the study, understanding, and improvement of science education, the public understanding of science, and even science itself. The minds of students and lay people are not blank slates that can simply be inscribed with any input. Instead, they come equipped with naive conceptions of the world, which constitute formidable cognitive obstacles for teachers and popularizers to overcome (Shtulman). Recently, much research in cognitive and developmental psychology, philosophy, and the history of science has been done on how intuitive ontologies make possible and thus influence the development, understanding, and acceptance of scientific theories and concepts (Carey and Spelke; Carruthers et al.; Evans et al.; Heintz; Nersessian). This volume aims to make a contribution to this literature and tease out the implications for the development, teaching, and understanding of science.

Naturalized, Social, and Evolutionary Epistemology

The philosophical tradition of naturalized epistemology takes seriously the insights from the cognitive sciences to understand the processes of knowledge generation and acquisition. As evolved biological creatures, humans have only limited cognitive and sensory abilities. In order to overcome these limitations and to develop and sustain counterintuitive scientific concepts, scientists rely on all sorts of help such as observational tools (e.g., telescopes), conceptual tools (e.g., analogies), and reasoning tools (e.g., logics). For that reason, philosopher Susan Haack describes science as common sense, but "more so" (101). One important scaffold is criticism by others. It is natural for us to look for arguments and facts that confirm rather than contradict our position. Hence, to have our views corrected, it is crucial that we submit them to the critical eye of our peers, who are similarly predisposed to defend their own ideas, but who are very happy to detect any errors in the beliefs and arguments of others (Mercier and Heintz). Science is thus necessarily and inherently social. To understand how science works, therefore, one needs to investigate how the social dimension adds to the development of scientific knowledge. This is the domain of social epistemology, to which rhetorical, historical, and sociological studies of science have made important contributions. These studies have clearly demonstrated that scientific

insights do not result from rigidly applying the scientific method, but emerge from the interactions among fallible human beings. However, in contrast to popular postmodernist and relativist interpretations, the social character does not infringe upon, but rather results in and corroborates science's epistemic strength (Goldman; Haack; Longino).

Evolutionary epistemology is the strand of naturalized epistemology that focuses on the evolutionary dimensions of knowledge generation. This philosophical project comes in various shapes. Evolutionary epistemologists such as Donald Campbell, Karl Popper, and David Hull have argued that science proceeds in ways analogous to biological evolution. Various hypotheses provide the variation from which the ideas and beliefs that best fit the world are selected and retained. Recently, however, the focus has shifted to the study of the implications of evolutionary approaches to the human mind for our understanding of science. How do our evolved abilities and constraints affect the course of science? More broadly, the term "evolutionary" also refers to a populational view that aims at explaining the distribution and stability of particular beliefs and ideas within the scientific culture. An epidemiology of representations enables us to identify and map the various causal factors, including our evolved abilities and the specifics (e.g., institutions, social arrangements, artifacts) of the environment that the minds of scientists engage with. As such, an epidemiological approach opens the way towards the integration of the various studies of science, and consequently, of the humanities, social sciences, and biological sciences (Heintz).

Consilience

Because of its interdisciplinary scope, this volume underwrites the reconciliation of rhetorical, narrative, cognitive, and epistemological perspectives—although some of the contributing authors are still skeptical. Whereas the rhetoric of science investigates which communication tools and strategies scientists deploy to convince others, cognitive science helps to shed light on why scientists use these particular tools and strategies and not others and why some, but not others, are successful. More fundamentally, a cognitive approach also helps to explain why arguments play such an important role in science, science communication, and education: they are constitutive of human reasoning—that is, of providing (convincing) reasons to persuade someone else of one's views (Mercier and Sperber; Sperber and Mercier).

Cognitive science also makes a valuable contribution to the debates about the two cultures in the sense that it puts doubt on the existence of a sharp

boundary between the two. Cognitive approaches to science assume that scientific thinking builds on ordinary cognition. Hence, there is no essential property, no silver bullet by which one could distinguish scientific from so-called other ways of reasoning. Scientists, too, rely on narrative thinking and other intuitive means of reasoning to develop their counterintuitive theories. This is not to deny that scientific cultures differ from other kind of cultures—science has its own institutions, organizations, procedures, and so on—but a cognitive approach implies that the difference will not be as clear-cut as the traditional two-culture approach suggests. An epistemological project that integrates the cognitive and cultural dimensions will enable us to develop a fine-grained understanding of the various scientific cultures, how they generate knowledge, and the similarities and differences between them. At the same time, it helps to explain what happens to scientific concepts outside these cultures, when transmitted to the larger public via (popular) science communication and education.

Contributions

In part 1, "Narrative and Rhetorical Perspectives," the volume brings together new work on the public understanding of science from the perspective of literature, narratology, cultural studies, anthropology, and rhetoric. In his chapter, "Experiencing Nature through Cable Television," David J. Tietge explores the relationship between cable television representations of nature and biology and how they influence the public understanding of environmental networks. The author argues that the metaphors, delivery, content, and orientation of such programming are guided by what Kenneth Burke calls an "occupational psychosis," a collective orientation that mirrors the economic principles of the culture in which such "edutainment" has been produced. More specifically, he is interested in how cable nature programming frames nature entertainment as a commercialized product that is to be consumed, capitalized on and expanded. According to Tietge, the anthropocentric nature programs discussed in his chapter start from the ideal that giving the audience what it wants—by relating to familiar ideological orientations such as *war, conflict,* and *competition*—is more profitable than representing nature from the traditional perspective of orthodox biological science. Representing nature as a product thus inevitably affects public attitudes about nature and the environment. In the final section, Tietge therefore argues that there is a need for a "rhetorical literacy" which would include "instruction on all educational levels in language structure; close critical readings of popular

texts, including cable nature programs; how logical arguments are constructed; what can be done with existing knowledge and how new knowledge can be made; and how people, agencies, corporations, and other institutions all have rhetorical reasons for presenting knowledge in a preordained way."

In his contribution, "Steven Pinker and the Scientific Sublime: How a New Category of Experience Transformed Popular Science," Alan G. Gross argues that although the rhetoric of science has become a vital subfield within rhetorical studies—a field within which he has been working for a long time already—the rhetoric of popular science has been largely ignored. Alan Gross has recently been working on a book project entitled *The Scientific Sublime: How Popular Science Unravels the Mysteries of the Universe,* in which he explores the popularization of science by (contemporary) scientists and science writers such as such as Steven Weinberg, Richard Feynman, Stephen Hawking, Richard Dawkins, Stephen Jay Gould, Brian Green, Rachel Carson, and Lisa Randall. He focuses on their argumentative skills to persuade the general audience about how science can answer fundamental questions about the human being and the universe, amongst other topics. Gross argues that these authors employ an overarching rhetorical concept, the *sublime,* as a category of experience that generates a sense of wonder at the discoveries of science. In his contribution to this volume Gross starts from this larger project and develops a critical analysis of the work of Steven Pinker. The sublime, he claims in this chapter, is a persuasive resource that is being used by Pinker and other scientist-popularizers. The author argues that Pinker's major works share a single overriding assumption: "science can be relied on to shed significant light on subjects far removed from the laboratory or the observatory and can astonish us by its revelations about language, about the mind, about human behavior generally, and about violence in particular." Gross argues that the scientific sublime is invoked and evoked in each of these works.

Although this specific reading and analysis of the work of Pinker is of course open to debate and discussion (and the work of Pinker and the topics he explores in his popular books have been discussed from many different perspectives), it is an example of a critical assessment and analysis of the rhetoric of popular science and popular scientists. It also exemplifies the complexity of bringing scientific debates to a larger audience through popular science.

In his chapter, "Architectonic Discourses and their Extremisms," Barry Brummett starts from the question: "What can humans know with some measure of confident certainty, and what can we know that must always be largely

contingent, exigent, and—in a word—arguable?" Taking Aristotle's distinction between discourses that offer sure and certain systems to guide distinctions, and those discourses (primarily rhetoric and dialectic) that manage decisions that are contingent and uncertain, Brummett explores a range of discourses that have historically claimed to be architectonic, or ruling, discourses. The author claims that the extremism consists not in resorting to sure and certain systems to guide decisions, but instead in resorting to these systems to guide decisions that ought to be decided rhetorically. The extremism in architectonic discourses is illustrated in a brief analysis of a website opposing childhood vaccinations. Brumett argues that the search for an architectonic discourse is a natural human desire. However, his contribution can be read as a plea to take any architectonic discourse with a great deal of caution.

In his chapter, "Science and the Idea of Culture," Richard van Oort argues that the conflict between the sciences and the humanities should not be understood in terms of the local "cultural" differences between scientists and humanists (C. P. Snow's "two cultures"), but rather in terms of the more fundamental problem of language origin: "Is language an extension of animal communication systems, or is it something radically different? Is it explainable in purely Darwinian terms, or is it an evolutionary anomaly (i.e., without precedent in evolutionary history)?" Van Oort argues that when it comes to explaining culture, science inevitably presses up against its limits. The central paradox of culture, according to van Oort, is that culture depends upon biology—"because culture requires brains and brains are the products of biological evolution"—but at the same time culture is also an institutional given. Van Oort starts by discussing the work of C. P. Snow, who criticized humanists for failing to take an interest in the work of their colleagues in the sciences and concurs that a genuine dialogue between humanists and scientists is rare. But van Oort argues that the problem of human origin (and specifically language origin) is one area in which dialogue seems both desirable and necessary, because it concerns both parties alike: "the sooner humanists recognize their stake in this fundamental question, the sooner they will be able to overcome their anxiety about the function of the humanities in a culture that privileges science as the only form of 'serious' cognition."

In their contribution, "A Rhetorical Analysis of the Two Cultures in Literary Fiction," Ronald Soetaert and Kris Rutten reconstruct the debate between and about the "two cultures" from a rhetorical perspective (focusing on "science wars" and perspectives from the "third culture"). Science and literature are described as particular terministic screens and the binary oppositions

between these different "ways of seeing" are problematized. The major focus is on the importance of rhetoric and narrative in general and the role and function of the humanities—literary culture—in particular. The authors analyze two novels (*Saturday* and *The Children Act*) as a case study to reflect upon how the novelist Ian McEwan problematizes and thematizes the confrontation between art and science. They argue that McEwan participates in the debate about the two cultures with novels with essayistic ambitions on the one hand, but that he accommodates scientific facts and arguments into his prose on the other hand. The fact that these McEwan novels are vehicles that reflect upon the relation between art and science implies that he uses the novel as an allegory to discuss major social and cultural problems. The works of McEwan that are discussed in this chapter can be read as part of an ethical turn in literature and a revival of humanism in twenty-first century literature. Both novels reflect upon (and defend) traditional humanistic values in general and the function of literature in particular.

In his chapter, "The Missing Link and Human Origins: Understanding an Evolutionary Icon," Peter C. Kjærgaard argues that in the history of evolutionary theory no single topic has attracted so much attention and caused so much public debate as the question of human origins. In the discussions following the discovery of hominin fossils in the late nineteenth and early twentieth centuries the idea of the missing link between humans and animals turned into what has historically become one of the most powerful icons of evolution. Until the mid-twentieth century, however, both adherents and critics of evolution hailed the missing link as a crucial proof of the correctness of the theory of human evolution. It continued to be a hot topic in public debates and as such a good selling point for popular science books equally exploited by journalists, professional science writers, and scientists. Despite the fact that the idea of a missing link as a necessary piece of evidence for human evolution bears no meaning in contemporary science, it is wrong to think that is has no relevance. The missing link's lasting effects on public understanding of human evolution has made it far more than a mere cultural product and as such it continues to be a problem in public engagement. This chapter presents a brief history of the missing link as an evolutionary icon in popular and scientific contexts.

In part 2, "Cognitive Perspectives," the contributions focus on how findings and insights from within the cognitive sciences can help us to understand and improve the public understanding of science. In her chapter, "Suspicion toward Science and the Role of Automatic Intuitions about Origins," Elisa Järnefelt argues that skeptical public attitudes to evolutionary theory and climate change

are anchored in the intuition that nature has been purposefully created by a supernatural being. As people will not easily revise their intuitive beliefs about these issues, scientists face the enormous challenge of finding ways to override them when communicating with the public. She concludes with a couple of suggestions in regards to science education and communication.

In her chapter, "Bridging the Gap: From Intuitive to Scientific Reasoning—The Case of Evolution," Margaret Evans examines the use of intuitions to jump-start more sophisticated reasoning, as has been proposed for mathematics. The question addressed in this chapter is whether core intuitions can also jump-start biological reasoning. Intuitive ideas can offer an immediate action plan that allows us to make a rapid appraisal of the human mind or the natural world. Yet, there is a downside, such as a reliance on what may be inaccurate scientific judgments, based on cognitive predispositions such as anthropomorphic or essentialist reasoning. Studies conducted with museum visitors will be used to support the argument that specific cognitive predispositions can both help and hinder understanding. Margaret Evans argues that core intuitions can provide a series of stepping-stones, which, if navigated with care, may promote science learning.

The chapter by Andrew Shtulman, "Missing Links: How Cladograms Reify Common Evolutionary Misconceptions," provides an excellent example of how thinking tools can enforce rather than override intuitive misconceptions. Developed as a conceptual tool to understand common ancestry and phylogenetic relationships, cladograms also tend to strengthen several popular misconceptions about evolution. This chapter focuses not on what the cladograms represent, but on what they fail to represent: extinction, diversity, and variation. These omissions are unproblematic in a scientific concept but they lead people to miscomprehend these three important evolutionary concepts.

In the final chapter of this section, "Representations of the Origin of Species in Secular (France) and Religious (Morocco) Contexts," Dominique Guillo reveals the complexity of people's ideas concerning evolution. In France, people who claim to accept evolutionary theory hold views that in fact come very close to intelligent design, which they share with nonevolutionists in Morocco. This shows the perpetual influence of cognitive biases. However, Guillo also finds that people's representations of the origin of species are often blurry and cannot be compared to the well thought out beliefs of evolutionary biologists. Instead of treating the blurriness as noise that needs to be removed to get at people's true beliefs, scientists might better regard it as characteristic of people's representations of the origin of species.

In part 3, "Epistemological Perspectives," we consider the epistemological implications of the social and cognitive aspects of science. In his chapter, "Updating Evolutionary Epistemology," Christophe Heintz considers Donald Campbell's evolutionary epistemology and specifies why it is a worthwhile project for explaining the evolution of science as a specific case of cultural evolution. However, he also criticizes Campbell's evolutionary epistemology for assuming that blind variation and selective retention is the process through which science evolves. This assumption, the author argues, is at odds with much of what we know about scientific cognition and the history of science. Heintz therefore proposes an updated research program for evolutionary epistemology, which faces new challenges.

The following chapter, "Intuition in Science Education and the Public Understanding of Science," by Stefaan Blancke, Koen Tanghe, and Johan Braeckman, examines the role of intuition in science communication in general. They start from the double role intuition plays in science itself: as a cognitive bias it detracts scientists from finding out about the real world, but as a scaffold it is indispensible for the construction of highly counterintuitive scientific concepts and theories. This double role puts science communicators in a peculiar position. On the one hand they need to develop educational tools, practices, and strategies to avoid the pitfalls of our intuitive reasoning; on the other hand they need to appeal to the very same intuition to instill a scientific understanding in their audience. As a result, some approaches that seem promising at first may turn out to have the opposite effect.

In the final chapter, "Vindicating Science—By Bringing It Down," Maarten Boudry and Massimo Pigliucci argue that there is no stark difference between the social and the rational. Nor is it the case that true beliefs are self-evident and that only flawed beliefs require a causal explanation. Instead, if we want to explain science's epistemic superiority, we need to take into account the factors that allow for and sustain the development of scientific beliefs, including the social.

Part 4 contains a thematic bibliography on narrative, rhetorical, cognitive, and epistemological perspectives on science and culture.

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